

U.S. Nuclear Innovation in a Global Economy

Updating an Outdated National Security Framework



July 2020



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Framework**

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I. Executive Summary

The U.S. Advanced Reactor Industry Has Promise But Needs Global Support. Advanced reactors have the potential to raise the global standard of living by providing clean, affordable, and reliable energy to the masses. And in a world suffering from the effects of climate change, with severe droughts, wildfires, and rising sea levels, developing this nascent industry—with its potential to provide immense amounts of carbon free power—becomes even more important.

For now, the U.S. leads in advanced reactor design, with dozens of domestic ventures in next-generation nuclear technologies. But this growing industry is running smack into a Cold War statutory framework that assumes any foreign participation in the U.S. nuclear industry is a national security risk, regardless of the partner. This framework has not changed since it was initially enacted in the early 1950s during the height of the Cold War, despite the fact that we live in a very different world today, nearly 70 years later.

Cold War-Era FOCD Restrictions Hinder U.S. Innovation & Jobs. Specifically, we are talking about the Atomic Energy Act's ("AEA") restriction on foreign, ownership, control, or domination (so-called "FOCD") of nuclear reactors, set forth in Sections 103(d) and 104(d) of the AEA (42 U.S.C. §§ 2133(d), 2134(d)). Under this restriction (the "FOCD Provision"), the U.S. Nuclear Regulatory Commission ("NRC"), the U.S. regulator for nuclear power, cannot license a reactor if the applicant is subject to FOCD, nor can it transfer an existing reactor license to a person or company subject to FOCD. Critically, the FOCD Provision applies the same regardless of the foreign participant's country of origin, whether Canada or North Korea. This is because the FOCD Provision is a product of the early Cold War, when nuclear technology was primarily limited to the United States and Soviet Union, globalization had not yet occurred, and the regulatory framework focused on preventing the sharing of nuclear technology, including technology designed for peaceful uses.

When the FOCD Provision was established, only a few countries were nuclear powers, and thus foreign involvement in nuclear power was viewed with great skepticism. This restriction was not a problem in the early years of U.S. nuclear power, as reactors were built and owned by local utilities, with little if any direct foreign involvement. However, today international partners play a key role in the U.S. nuclear industry and have large stakes in U.S.-based reactor designers and fuel cycle companies (such as uranium enrichment companies and fuel fabricators). Foreign investment from our allies, far from being viewed with skepticism, is instead critical for the U.S. civilian nuclear industry to succeed.

In this era of global partnership, the FOCD Provision – as applied by the NRC – has led to absurd outcomes. Ultimately, because of this law, *projects were cancelled, costing billions of dollars for the struggling commercial U.S. nuclear power industry.* Examples include:

- 2012 NRC denial of an effort by the French nuclear giant Électricité de France, S.A. ("EDF"), ongoing since 2007, to build a new nuclear reactor in Maryland which would have provided thousands of jobs, hundreds of millions of dollars in revenue, and millions of megawatt-hours of carbon-free power.
- 2011 NRC staff denial of a joint U.S.-Japanese effort to build a new nuclear reactor in Texas, also ongoing since 2007, which would have again provided thousands of U.S. jobs and millions

of MWh of clean energy. Here, the U.S. partner left the project but Toshiba, a mere 10% owner of the project, used its own capital to drive it forward. The NRC staff denial of the project was only overturned years later in 2015—after a successful legal challenge of the NRC staff’s decision—but also after significant damage was done to the project’s economics and it was later cancelled.

- Application of very onerous corporate governance provisions to multiple nuclear plant projects—including restrictions on company management and establishment of a Special Nuclear Committee of the Board of Directors—an even to a mere 1.7% investment in a nuclear plant by a Canadian company.
- Even commercially insignificant projects have experienced the illogic of the U.S. laws, when NRC required a four-levels removed subsidiary of a Swedish company to sell its small research reactor to a U.S. entity because the licensee’s ultimate parent was headquartered abroad.

Without Congressional action, the FOCD Provision will inhibit investment in U.S. advanced reactor innovation, which needs significant financial participation to move from the drawing board to the field. As applied by the NRC, this outdated provision of the AEA creates significant investment uncertainty. At best, it places onerous and expensive corporate governance restrictions and oversight requirements on many types of foreign investments in reactor license applicants—or their parent companies—even if the investments are from long-time U.S. partner such as Canada and Japan. At worst, it can result in a license being denied and a project terminated—like UniStar’s Calvert Cliffs Unit 3 project—because of the foreign investment.

Our allies are interested in supporting U.S. advanced reactor vendors, and often have higher tolerance for these investments than their U.S. counterparties. However, instead of safeguarding American interests, maintaining this outdated law is more likely to push advanced reactor developers out of the country to demonstrate their technologies and will stifle investment in those that remain, harming U.S. nuclear technology leadership, U.S. nuclear export prospects (as there will be fewer U.S.-designed and built plants to thereafter export abroad), and overall nuclear security.

The FOCD Provision Offers No National Security Benefit. A law that cannot distinguish the national security risk between a Canadian versus a North Korean investment is not a useful tool for safeguarding national interest. That is why the U.S. government has developed many other tools to monitor and protect against impermissible investments in the U.S. nuclear industry. At the forefront is the Committee on Foreign Investment in the United States (“CFIUS”), which polices all significant foreign investments into the nuclear industry and was recently strengthened by Congressional action. This interagency review process is better suited to evaluate investment and national security implications compared to the NRC, a safety regulator composed largely of scientists and engineers.

Additionally, the U.S. Department of Energy (“DOE”) and other export control regimes already police the transfer of nuclear technology without prior notice or approval from the U.S. government. Lastly, the NRC itself implements a parallel but more flexible “inimicality” review of foreign investments into U.S. reactor licensees, apart from its own FOCD review, and applies the “inimicality” standard to non-reactor licensees. This inimicality review, required under the same section of the AEA that houses the FOCD Provision (42 U.S.C. §§ 2133(d), 2134(d)), separately allows the NRC to deny a reactor license (and other non-reactor licenses) that are contrary to U.S. national security interests.

Recommendations to Improve U.S. Nuclear Innovation.

- *Recommendation 1: Congress should strike the FOCD Provision from Section 103(d) and 104(d) of the AEA.*
- *Recommendation 2: In the alternative, Congress should amend the FOCD Provision in the AEA to permit the NRC to exempt certain low-risk countries from FOCD review. Congress should then require the NRC to develop and present to Congress a list of countries to be exempted from FOCD review within 180 days (including countries with established non-proliferation records), and complete a rulemaking codifying the exemption within two years.*

The FOCD Provision will significantly restrict safe and helpful investment into U.S. advanced reactors by our allies. As nuclear innovation in nuclear power is increasingly occurring outside of the United States, the U.S. government—Congress included—must encourage instead of bar foreign direct investment from our allies and neighbors to grow this industry and international trade.

The proposed amendments to the AEA, which can be easily inserted into pending nuclear legislation, recognize the importance of foreign investment into the U.S. nuclear industry, while acknowledging the important role current national security and foreign investment protections already offer. The changes would also significantly expand opportunities for our allies to financially support advanced reactor projects in the United States, helping our country regain its global leadership role in nuclear power.

II. Today's Interconnected Nuclear World Collides with a 1950s National Security Framework

A. Innovation in Advanced Reactors is Truly Global

Developing and building advanced reactor technology is a thoroughly global venture. The United States, while a leading contributor, is a partner in a global nuclear industry.

Nothing demonstrates this better than looking at the current U.S. nuclear industry itself. Outside of nuclear reactors themselves, the U.S. industry is characterized by joint ventures and close collaborations with our strongest national allies. For example, Westinghouse, which developed the first commercial nuclear reactor and is considered to be one of the most well-known U.S. nuclear companies,¹ is indirectly owned by a consortium of Canadian private equity firms, with majority ownership acquired by Brookfield Business Partners LP in August 2018. Before that, Westinghouse was previously owned by Toshiba, a Japanese company, and before that by British Nuclear Fuels.² Leading nuclear vendor GE-Hitachi, which commercialized the Boiling Water Reactor, is a joint venture 60% owned by GE, and 40% by Hitachi.³ The only commercial nuclear fuel enrichment facility in the United States, the URENCO USA facility in New Mexico, is owned by a European consortium.⁴ And the list goes on.

All of these joint ventures and foreign investments into the nuclear supplier community were subject to U.S. national security reviews at the time, from CFIUS and nuclear export control regulators. Despite the fact that these joint ventures handle enriched nuclear fuel and own fuel fabrication facilities, the FOCD restriction does not apply to them because they do not specifically own *nuclear reactors*. And these ventures have largely worked well—enabling U.S. businesses to benefit from the financial strength and significant technical and business capabilities of foreign companies.

Likewise, innovation in advanced reactor development is largely global. For now, the U.S. leads in advanced reactor design. There are dozens of domestic ventures in next-generation nuclear technologies.⁵ However, while many innovators in the nuclear industry are based in the United States,⁶ a number of leading innovators are from abroad. For example, Terrestrial Energy, a Canadian company, was granted a large DOE award to help develop an Integrated Small Modular Reactor in the United States.⁷ NuScale recently formed a partnership with Doosan, a South Korean company, to work together on fabrication of reactor components.⁸ Lightbridge, a leading U.S. nuclear fuel innovator, formed an alliance with France's Framatome to develop a new safer, more efficient nuclear

¹ *Shippingport Nuclear Power Station: First US Commercial Central Electric-Generating Station to Use Nuclear Energy*, The American Society of Mechanical Engineers, <https://www.asme.org/about-asme/engineering-history/landmarks/47-shippingport-nuclear-power-station>.

² *2018 Annual Report*, Brookfield Business Partners L.P., at 41, <https://bbu.brookfield.com/~media/Files/B/Brookfield-BBU-IR-V2/Annual%20Reports/bbp-q4-annual-report-2018.pdf>.

³ Soichi Inai, *GE Hitachi Nuclear Developing New SMR with US Company*, Nikkei Asian Review (Mar. 14, 2017), <https://asia.nikkei.com/Business/GE-Hitachi-Nuclear-developing-new-SMR-with-US-company>.

⁴ See *Global Operations*, URENCO (last accessed Oct. 31, 2019), <https://urencocom/global-operations>.

⁵ *Keeping Up with the Advanced Nuclear Industry*, Third Way (Jan. 2018), <https://www.thirdway.org/graphic/keeping-up-with-the-advanced-nuclear-industry> (showing a marked increase from the previous year)

⁶ See *2019 Advanced Nuclear Map*, Third Way (last accessed Oct. 30, 2019) <https://www.thirdway.org/graphic/2019-advanced-nuclear-map>.

⁷ *U.S. Advanced Nuclear Technology Projects to Receive \$18 Million from the U.S. Department of Energy*, Office of Nuclear Energy, U.S. Department of Energy (Nov. 13, 2018), <https://www.energy.gov/ne/articles/us-advanced-nuclear-technology-projects-receive-18-million-us-department-energy>.

⁸ *Doosan, NuScale Sign Agreements for SMR Cooperation*, World Nuclear News (Jul. 24, 2019), <https://www.world-nuclear-news.org/Articles/Doosan,-NuScale-sign-agreements-for-SMR-cooperatio>.

fuel.⁹ Of the winners of Britain’s Advanced Modular Reactor competition, six are based outside the United States and all eight are global companies.¹⁰ Indeed, of the existing fast-neutron reactors in the world, two are in India, two are in Japan, and three are in Russia.¹¹

In this global nuclear economy, our allies are working hard to foster innovation in their countries and with the United States. Canada is leading an effort to establish their nuclear laboratory at Chalk River as a leading global innovation, including for U.S. entrepreneurs.¹² U.S. companies are increasingly looking to Canada,¹³ the United Kingdom,¹⁴ and other destinations to license their first prototype reactors. At the same time, leading foreign innovators like Terrestrial¹⁵ and URENCO are looking to the U.S. as a potential second home.

Now is a pivotal moment in U.S. nuclear innovation. Russia and China are investing billions into their domestic advanced reactor programs, and have successfully demonstrated advanced reactor technologies, such as the BN-800 sodium-cooled fast breeder reactor. China has started building its first small modular reactor (SMR), the ACP100 integrated pressurized water reactor (PWR), which was the first SMR to pass the IAEA’s safety review back in 2016.¹⁶ For the U.S. to compete, it cannot go it alone, and the developing advanced reactor industry should benefit from the experience and investment from outside the United States. The U.S. government must embrace global investment into its nuclear industry, and form stronger relationships with its neighbors and key allies, to help offset a global nuclear framework increasingly led by other world powers with dissimilar interests.

B. An Outdated Atomic Energy Act Framework Restricts Nuclear Investment, Even From Our Closest Allies

The AEA FOCD Provision: There is an important headwind, however, to building out a future where the U.S. leads nuclear innovation in a global economy. Created during the height of the Cold War and in early stages of the nuclear industry, when only the United States and Soviet Union had nuclear power, a specific provision of the AEA, found in Sections 103(d) and 104(d) (42 USC §§ 2133(d), 2134(d), respectively) bars foreign ownership, control, or domination of a U.S. nuclear reactor licensee (again, these provisions are referred to collectively as the “FOCD Provision”). The NRC incorporates this restriction into its regulations at 10 CFR 50.38. This rule applies to all types of nuclear reactors, including large commercial reactors and even demonstration reactors and medical isotope production facilities—but it does not apply to nuclear fuel vendors or reactor suppliers.

⁹ *Lightbridge and Framatome Launch Enfission to Commercialize Innovative Nuclear Fuel*, Lightbridge (Jan. 25, 2018), <http://ir.ltbridge.com/news-releases/news-release-details/lightbridge-and-framatome-launch-enfission-commercialize>.

¹⁰ *See Rolls-Royce Group Wins Funding as UK SMR Race Gathers Pace*, Nuclear Energy Insider (Sep. 11, 2019), <https://analysis.nuclearenergyinsider.com/rolls-royce-group-wins-funding-uk-smr-race-gathers-pace>.

¹¹ *Advanced Nuclear Reactors: Technology Overview and Current Issues*, Congressional Research Service, Table A-1, at 42, (Apr. 18, 2019), <https://crsreports.congress.gov/product/pdf/R/R45706>.

¹² *See CNL Releases Exciting Vision for the Chalk River Laboratories*, Canadian Nuclear Laboratories (Apr. 25, 2017), <https://www.cnl.ca/en/home/news-and-publications/stories/2017/20170425.aspx>.

¹³ *See, e.g., New Brunswick Power: Partner Announced in Nuclear Research Cluster*, Advanced Reactor Concepts Newsroom (Jul. 9, 2018), <https://www.arcnuclear.com/arcnews/new-brunswick-power-partner-announced-in-nuclear-research-cluster>.

¹⁴ *See, e.g., Advanced Modular Reactor (AMR) Feasibility and Development Project*, Government of the United Kingdom (Sep. 5, 2018) <https://www.gov.uk/government/publications/advanced-modular-reactor-amr-feasibility-and-development-project>.

¹⁵ *Terrestrial Energy USA Signs MOU with Energy Northwest for Idaho National Laboratory Project*, Terrestrial Energy (Mar. 28, 2018), <https://www.terrestrialenergy.com/2018/03/terrestrial-energy-usa-signs-mou-with-energy-northwest-for-idaho-national-laboratory-project/>.

¹⁶ *See China’s ACP100 passes IAEA safety review*, Nuclear Engineering International (May 4, 2016), <https://www.neimagazine.com/news/newschinas-acp100-passes-iaea-safety-review-4883437>.

Specifically, the AEA's FOCD Provision states:

No license may be issued to an alien or any corporation or other entity if the Commission knows or has reason to believe it is owned, controlled, or dominated by an alien, a foreign corporation, or a foreign government.

The Historical Context of the FOCD Provision: The FOCD requirement was added in the 1954 revision to AEA, which opened up nuclear energy to civilian development. At the time, the world was a very different place than it is today. Atomic energy was still being valued primarily for its *military* contribution—the Cold War was well underway, the Soviet Union and United Kingdom had started testing nuclear warheads, and in early 1954 the world's first nuclear-powered submarine, the USS *Nautilus*, was launched. The use of the atom for civilian purposes was only starting to be explored:

- In December 1953, President Eisenhower gave his famous “Atoms for Peace” speech, where he pledged that the U.S. would share peaceful nuclear technology with the world, if the receiving nation committed to not use the technology to develop nuclear weapons.¹⁷
- In early 1954, construction began in Pennsylvania on the Shippingport reactor, the first civilian nuclear power project to supply electricity to the grid (which it did three years later in 1957).

Because the civilian nuclear power industry was born out of U.S. defense work, the U.S. government believed in 1954 that it needed to be very careful with the spread of this new technology. After all, both the Shippingport reactor design and the *Nautilus* reactor design came out of the U.S. national laboratories based on similar designs, both were constructed by Westinghouse, and both were developed under the leadership U.S. government—specifically, then-Captain Hyman Rickover, the father of the then-emerging U.S. nuclear Navy.¹⁸

Thus, when the FOCD provision was enacted, it was the product of a different era—an era well before the development of post-World War II's globalized world, and the modern, global nuclear industry. There was an inherent distrust of foreign involvement in nuclear power, and the FOCD Provision seemed to make sense given the uncertainty of where atomic energy would lead humanity.¹⁹ Concerns existed, for example, that foreign ownership could raise the risk of diversion of nuclear fuel or spent nuclear fuel generated at these power plants—ownership of enriched uranium and plutonium was limited to just a few countries at the time, much different than today. In fact, private ownership of enriched uranium and plutonium was prohibited until the 1964 amendments to the Atomic Energy Act.

However, the world that has developed today is incredibly different than that of 1954, and probably could not have been imagined by the drafters of the 1954 AEA. The civilian nuclear industry has blossomed, and nearly all of our allies operate nuclear power plants and fuel cycles of their own. France derives over 70% of its energy from nuclear power,²⁰ and Westinghouse—the creator of the

¹⁷ Address by Mr. Dwight D. Eisenhower, President of the United States of America, to the 470th Plenary Meeting of the United Nations General Assembly (Dec. 8, 1953), <https://www.iaea.org/about/history/atoms-for-peace-speech>.

¹⁸ More about the historical background about the development of nuclear power can be found in the article: Michael Wallace, Amy Roma, and Sachin Desai, Center for Strategic and International Studies, *Back from the Brink: A Threatened Nuclear Energy Industry Compromises National Security* (Jul. 2018), <https://www.csis.org/analysis/back-brink-threatened-nuclear-energy-industry-compromises-national-security>.

¹⁹ More about the legislative history of the FOCD Provision can be found in Part II of the academic article: Sachin Desai & Kathy Oprea, *U.S. Nuclear Foreign Ownership Policy Ready for a Refreshed Interpretation*, 37 Energy L.J. 85 (2016), https://www.ebanet.org/assets/1/6/21-85-134-Desai_FINAL.pdf.

²⁰ International Atomic Energy Agency, *Country Nuclear Power Profiles, France* (updated in 2019), <https://cnpp.iaea.org/countryprofiles/France/France.htm>.

Shippingport reactor mentioned above, was for a long time owned by Japan's Toshiba, before now being owned by a consortium led by a Canadian firm.²¹

This leaves the FOCD Provision a product of a bygone era—and even in 1954 members of the government and public recognized that the limited monopoly on civilian nuclear technology was to be short-lived, and curtailing foreign involvement in nuclear power was not in the best long-term interests of the country—with one group noting: “Discrimination against noncitizens and foreign corporations may deter the full development and utilization of atomic energy in this country, since it will discourage foreigners from putting their peaceful discoveries to work in our own country.”²² That warning from the 1950s rings particularly true today.

The AEA FOCD Provision in Practice Today: Nonetheless, without direction from Congress, the NRC and its agency staff have been left to apply an incongruous Cold-War era concept in the modern day. Because of the direct language of the FOCD Provision, the NRC has interpreted the language of the FOCD Provision as creating a clear prohibition on 100% indirect foreign ownership of an operating reactor by a licensee.²³ Moreover, the NRC has never approved more than about 50% indirect ownership of a licensee by a foreign interest, or *any* foreign direct ownership of a power plant by a foreign interest.²⁴ Moreover, because the FOCD Provision is country-neutral, an investment from Canada is treated the exact same as one from North Korea. Indeed, the NRC has used this provision, for example, to deny a license to a Canadian company in the past,²⁵ and more recently to a French company that sought to build a reactor in the United States of its own design.²⁶

Even when not denying licenses under the FOCD Provision, the agency throws up significant roadblocks with even lesser levels of investment or control—as little as 1.7%. In those limited cases where the NRC has permitted foreign ownership, it has imposed significant restrictions on the entities involved. The NRC permits the use of Negation Action Plans to theoretically “mitigate” foreign control, by assuring that “the foreign interest can be effectively denied control or domination.”²⁷ These requirements are very strict, however, greatly complicating corporate governance and disincentivizing foreign investment into an already complex industry.²⁸ More fundamentally, the purpose of Negation Action Plans is to eliminate foreign involvement in a nuclear reactor, which is simply incongruous with global collaboration on nuclear innovation and advanced reactor development. In the future, nuclear innovators, no matter if they hail from the U.S. – or Canada, Japan, or Europe – need to be involved in the operation of reactors they designed and built because they know the technology best. This created a significant barrier today to foreign investment in U.S. nuclear power.

²¹ World Nuclear News, Toshiba Sells Westinghouse-Related Assets in USA (Apr. 6, 2018), <http://www.world-nuclear-news.org/Articles/Toshiba-sells-Westinghouse-related-assets-in-USA>.

²² Desai & Oprea, *supra* note 19, at 97.

²³ *Fresh Assessment of Foreign Ownership, Control, or Domination of Utilization Facilities*, NRC Staff, SECY-14-0089, at 6 (Aug. 20, 2014), <https://www.nrc.gov/docs/ML1330/ML13301A684.pdf> (“SECY-14-0089”).

²⁴ *Id.*

²⁵ *Id.* at 23-24.

²⁶ See *infra* § III.A (discussing Calvert Cliffs reactor expansion example)

²⁷ SECY-14-0089, Enclosure 2: Commission Case Law, Agency Case Histories, and FOCD Negation Action Plans, at 22 <https://www.nirs.org/wp-content/uploads/2016/07/secy-14-0089encl.-2.pdf>.

²⁸ Negation Action Plans often require that: (1) the majority of the licensee’s directors and principal officers must be U.S. citizens; (2) the company establish a special committee to ensure all AEA-licensed materials are used “consistent with the common defense and security and public health and safety,” comprised of U.S. citizens independent of the board of directors and the foreign investor. *Id.*

III. The FOCD Provision Continues to Harm U.S. Nuclear Innovation

A. FOCD Rules Impeded Crucial Foreign Investment in New U.S. Nuclear Projects and Led to Project Demises

It is unusual that one sentence of the AEA could cost billions of dollars of lost investment into a U.S. industry – but that is the case with the FOCD Provision. While there is a wealth of capital waiting to be invested into domestic nuclear innovation and jobs, it has been scared away by the very negative precedent set by the NRC’s interpretation and application of the FOCD Provision in the early 2000s.²⁹

Example 1: FOCD Provision Barred a French Effort to Construct a New Nuclear Plant in Maryland

Probably the most striking example of the FOCD Provision inhibiting constructive foreign investment concerns a French effort to build a new reactor (of its own French design) in Maryland, costing the nuclear industry hundreds of millions of dollars.

In 2007, Électricité de France, S.A. (“EDF”), a French nuclear vendor and utility, and Constellation Energy Group, Inc. (“Constellation”), a U.S. nuclear utility, formed a joint venture called UniStar and submitted an application to the NRC to build a new unit at the existing Calvert Cliffs nuclear power plant.³⁰ Critically, the reactor was to be of the French Evolutionary Power Reactor (“EPR”) design, so the flow of capital and technology was inward bound. The foreign country, France, is a long-standing ally that generates nearly three quarters of its electricity from nuclear power³¹—hardly the type of country the U.S. should be policing investment from.

The application was submitted to the NRC in mid-2007.³² After five years and hundreds of millions of dollars invested, Constellation had to back out of the project, but EDF decided to move forward with licensing and construction and acquired Constellation’s 50% share of UniStar.³³ The result was that the French would entirely fund construction of a new nuclear reactor on U.S. soil, bringing thousands of U.S. jobs and new nuclear technology.

However, the FOCD Provision compromised the project. The NRC staff concluded that the new arrangement resulted in 100% indirect foreign ownership of an NRC license, and that no mitigation measure could address this problem.³⁴ Eventually, an NRC administrative licensing board determined that the project ran afoul of the NRC’s FOCD provision, and denied the license to UniStar in 2012.³⁵

²⁹ Energy deregulation occurred in the late 1990s/early 2000s, leading to an increase in foreign investment in U.S. utilities and thus driving development of the NRC’s FOCD precedent.

³⁰ *Calvert Cliffs 3 Nuclear Project, LLC* (Calvert Cliffs Nuclear Power Plant, Unit 3), LBP-12-19, 76 NRC 184, 187 (2012), *aff’d*, CLI-13-4, 77 NRC 101 (2013).

³¹ *Nuclear Power in France*, World Nuclear Association (last updated Oct. 2019), <https://www.world-nuclear.org/information-library/country-profiles/countries-a-f/france.aspx>.

³² Application Review Schedule for the Combined License Application for Calvert Cliffs, Unit 3, NRC (last updated Mar. 28, 2017), <https://www.nrc.gov/reactors/new-reactors/col/calvert-cliffs/review-schedule.html>.

³³ Letter Re: Calvert Cliffs 3 Nuclear Project, LLC, and UniStar Nuclear Operating Services, LLC (Calvert Cliffs Nuclear Power Plant, Unit 3), Docket No. 52-016-COL (Nov. 3, 2010), <https://adamswebsearch2.nrc.gov/webSearch2/main.jsp?AccessionNumber=ML103070520>.

³⁴ LBP-12-19, 76 NRC at 188-89.

³⁵ *Id.*

The result was that after seven years of effort and hundreds of millions of dollars, the FOCD Provision completely halted the French project on grounds that had nothing to do with safety or security.

Example 2: FOCD Provision Greatly Impeded a Japanese Effort to Build a New Nuclear Plant in Texas

Just a few years later, the FOCD Provision nearly terminated a promising effort to build two new nuclear reactors in Texas, again costing the industry billions of dollars in stranded investments and lost revenue.

In this case, Nuclear Innovation North America (“NINA”), a partnership between U.S.-owned NRG Energy (the major, 90% project owner) and Japan’s Toshiba (the reactor vendor and 10% project owner), applied to the NRC in 2007 to build two new reactors in Texas.³⁶ After Fukushima in 2011, the U.S. partner again hesitated to move forward, but the foreign party was still willing to take the project across the finish line as the NRC license review was nearly complete. Here, Toshiba took it upon itself to continue to fund the NRC licensing of the project in full, even though it would still possess just 10% of the project’s overall value and would gain no additional benefits as to corporate control.

Despite being only a 10% owner, Toshiba preemptively instituted a Negation Action Plan to offset its already limited control of the project. This plan eliminated foreign control of all matters pertaining to nuclear safety, security, and reliability, put key decisionmaking authority in the hands of U.S. citizens, required many key personnel be U.S. citizens, and instituted a board-level security committee and separate advisory committee to monitor foreign control.³⁷ In practice, such Negation Action Plans are expensive to maintain, and create significant additional burdens on plant owners and operators—all just to prevent a steadfast US ally and robust nuclear power, Japan, from having ‘too much’ control of a power plant that a Japanese company itself designed.

Nonetheless, after Toshiba took on this risk to support U.S. nuclear innovation at great cost to itself, the NRC staff looking to the FOCD Provision decided in 2011 (and reaffirmed in 2013) that NRG’s “diminishing financial position” put Toshiba “in a position to control and dominate NINA,” and thus made the applicant, NINA, ineligible for an NRC reactor license.³⁸ The NRC staff even used as a reason for the decision the risk of diversion of the uranium fuel and spent nuclear fuel from the to-be-built reactors, despite Japan having dozens of its own power plants. It thereafter took approximately five years of failed negotiations with the NRC staff, and eventual litigation with the agency before an administrative licensing board, before the agency over 2014 and 2015 reversed course and found that Toshiba’s mere funding of the application did not interfere with NINA’s “exclusive control” of decisions involving nuclear safety, security, and reliability.³⁹

The licensing board took a reasonable view of the FOCD provision, but this was perhaps too little too late. The huge five-year delay to the project’s licensing—attributable almost entirely to the FOCD provision—led to enormous cost increases and was a key factor in its eventual termination.

Other Examples: FOCD Negation Action Plans Discourage Even Small Investments into Nuclear Power

³⁶ *Nuclear Innovation N. Am. LLC* (South Texas Project Units 3 & 4), LBP-14-3, 79 NRC 267, 286 (2014), *aff’d*, CLI-15-7, 81 NRC 481 (2015).

³⁷ *Combined License Application for South Texas Project Units 3 & 4 Expansion, Negation Action Plan* (2015) <https://www.nrc.gov/docs/ML1512/ML15124A111.pdf>.

³⁸ *Nuclear Innovation N. Am. LLC*, LBP-14-3, 79 NRC at 276.

³⁹ *Id.* at 291-312.

Even for those investments that did not find themselves barred by the FOCD Provision, strict Negation Action Plan provisions applied to low-risk investments, setting difficult precedent for the industry.

- **Strict Negation Action Plan Requirements for Miniscule Investments:** When a Canadian company, Gaz Metro, tried to make a mere 1.7% investment into the NRC licensees for the Millstone Nuclear Power Station, the NRC staff imposed a strict Negation Action Plan to prevent Gaz Metro from having any control over the plant operation (which it did not have anyway).⁴⁰ In particular, the licensee had to stand up a Special Nuclear Committee of U.S. citizens, a majority of whom are not officers, directors, or employees of any of the parties. The cost of maintaining these committees can easily exceed \$1 million a year.
- **Implicit 50% Ownership Cap:** The NRC has traditionally capped foreign investment at 50% under the FOCD rules. This precedent developed in the 1990s when British Energy tried to take a 50% or greater investment in the Clinton nuclear power plant in Illinois, in a joint venture with PECO Energy (a precursor to Exelon),⁴¹ and has extended to the current day. Even with a 50% investment by a strong U.S. ally, the NRC staff imposed a burdensome Negation Action Plan, including the requirement for a board committee to monitor FOCD issues and provide frequent reports, at the cost of millions a year to maintain. These costly Negation Action Plans have worked their way into multiple new reactor projects, including with the South Texas Project discussed above, and in another effort to construct two nuclear power reactors in Texas around the same time period.⁴²
- **Indirect Ownership of a Test Reactor.** The NRC determined that Aerotest, a holder of an operating license for a radiography and research reactor, was in violation of the FOCD rules when all the stock of its indirect U.S. parent was purchased by a U.S. company owned by a Delaware corporation traded on the New York Stock Exchange but headquartered in Sweden. Although Aerotest adopted a “negation plan” to assure that all safety related decisions relating to the operation of the research reactor were made by U.S. citizens, the NRC insisted that Aerotest was out of compliance with Section 104d of the AEA, which resulted in a forced sale of the reactor to a U.S. company.

B. FOCD Rules Can Present Even Greater Problems for Advanced Reactors

As discussed above, advanced reactor innovation is being led by global collaboration, from the GE-Hitachi joint venture to NuScale’s collaboration with Doosan. Several companies with 100 percent foreign upstream ownership, such as Terrestrial and URENCO, are also promising leaders in nuclear innovation in the United States. Moreover, as demonstrated by the above Maryland and Texas reactor projects, foreign investors have generally shown a much larger appetite and risk tolerance to new nuclear projects in the United States—staying involved even when U.S. domestic partners would not. That is one reason why foreign private equity companies are eager to invest in U.S.-based nuclear innovators, whether Canada’s investment in Westinghouse or South Korea’s interest in partnering with NuScale.

⁴⁰ See NRC Safety Evaluation by the Office of Nuclear Reactor Regulation, Application for the Indirect Ownership Interest in the License for Millstone Power Station, Unit 3, Docket No. 50-423 (Jun. 15, 2012), <https://www.nrc.gov/docs/ML1213/ML121300496.pdf>.

⁴¹ Safety Evaluation for the Proposed Transfer of Clinton Power Station Operating License from Illinois Power Company to AmerGen Energy Company, LLC, Docket No. 50 461, § 5.0 (Nov. 24, 1999).

⁴² *Combined License Application for Comanche Peak Nuclear Power Plant Units 3 and 4 Expansion, Negation Action Plan* (2010), <https://www.nrc.gov/docs/ML1334/ML13345A334.pdf>.

This complex network of advanced reactor partnerships risks hitting a brick wall with the FOCD Provision, just as EDF and Toshiba did during the “Nuclear Renaissance.” New nuclear reactor ventures will require significant foreign investment that will be difficult to untangle. Foreign investors will not be keen to invest in reactor development when they are prohibited from owning revenue-generating assets. Further, foreign technology from our long-standing allies will likely be behind key parts of many new reactor designs, making it hard—if not simply impossible—to separate the foreign partner when it comes to key decisions about advanced reactor safety and security. Given the already numerous undertakings that exist with licensing an advanced reactor, the added significant cost and uncertainty of addressing U.S. FOCD rules will tip the scales for foreign participants against further investment into nuclear power in the United States, just when it is needed most to offset gains in nuclear leadership by others.

IV. Other Foreign Investment Regimes Already Protect U.S. National Security

Apart from the FOCD Provision, three robust programs are already in place to protect U.S. national security interests from improper foreign control of a U.S. nuclear business.

The first is the Committee on Foreign Investment in the United States (“CFIUS” or “Committee”). CFIUS is an interagency committee that reviews certain foreign transactions to evaluate the potential foreign investment’s implications on U.S. national security. The Treasury Secretary is the chairperson of CFIUS, and DOE is represented on the Committee. Nearly all material investments in nuclear power fall under the Committee’s jurisdiction. CFIUS members holistically evaluate a transaction’s implications on national security and can request additional information from the parties. It has a broad remit to impose conditions on the parties to mitigate national security risks, with the ability to even suspend transactions altogether.

Moreover, CFIUS’s powers have been greatly strengthened by passage of the 2018 Foreign Investment Risk Review and Modernization Act (“FIRRMA”), which also created a mandatory filing program for many types of material investments into nuclear technology companies.⁴³ Although this mandatory filing is relatively short (five pages or less), it could often lead to much more extensive filings. The result is that if a foreign investor wishes to finance a U.S. nuclear innovator, it would have to likely file a lengthy disclosure document with CFIUS, which would evaluate the transaction with input from up to sixteen federal agencies or departments.

Second, there are multiple regimes that police the export of sensitive technology—nuclear technology included—to foreign companies. Most important in this regard is the DOE’s export controls regulations specific to nuclear technology, found in 10 CFR Part 810 (and often called the “Part 810 Regulations”). The Part 810 Regulations require notification to DOE for any export of technology or assistance related to development or use of nuclear fuel or nuclear reactors—even if that export is to a foreign person located in the United States (a so-called “deemed export”). In many cases, such as exports of sensitive technologies like uranium enrichment, or for exports to sensitive destinations such as Russia or China (or citizens of Russia and China in the United States), prior agency approval is needed which can often take a year or more to obtain. Following a 2018 announcement by DOE,⁴⁴ the Part 810 regulations practically bar all exports of advanced reactor technology to China. As any significant investment into a nuclear company implicates an exchange of nuclear technology, this

⁴³ *Review of Foreign Investment and Export Controls*, Title XVII of the FY 2019 National Defense Authorization Act (NDAA), Public Law 115-232, 132 Stat. 2173 (Aug. 13, 2018), https://home.treasury.gov/sites/default/files/2018-08/The-Foreign-Investment-Risk-Review-Modernization-Act-of-2018-FIRRMA_0.pdf.

⁴⁴ *U.S. Policy Framework on Civil Nuclear Cooperation with China*, DOE National Nuclear Safety Administration (Oct. 2018), https://www.energy.gov/sites/prod/files/2018/10/f56/US_Policy_Framework_on_Civil_Nuclear_Cooperation_with_China.pdf.

prohibition serves to bar most Chinese investments into the U.S. nuclear industry, completely unrelated to the FOCD Provision.⁴⁵

Third, the NRC itself performs an “inimicality” review in addition to and separate from its generic FOCD review. The same section of the AEA that established the FOCD Provision (42 U.S.C. §§ 2133(d), 2134(d)), also states that “no license may be issued to any person within the United States if, in the opinion of the Commission, the issuance of a license to such person would be inimical to the common defense and security or to the health and safety of the public.” This statutory provision requires the NRC to essentially conduct another review process of “foreign interests involved in the licensing of” nuclear reactors.⁴⁶ However, the NRC’s inimicality review benefits from being tailored to the country at issue, so that an investment into a nuclear reactor operator by Canada is not treated the same as an investment from North Korea, which provides critical and reasonable flexibility that the current FOCD Provision does not.

The NRC’s inimicality review has been used without issue for the NRC to evaluate the national security concerns associated with foreign investment and control of important nuclear facilities other than nuclear power plants (for which the NRC’s FOCD Provision does not apply). For example, in the licensing of the United States’ sole uranium enrichment facility—the National Enrichment Facility in New Mexico, a facility with arguably greater national security implications than a nuclear power plant—the NRC reviewed the applicant’s foreign parent involvement in detail as part of its non-inimicality review, including complex creditor arrangements and control of nuclear material, and also worked with DOE to establish processes to safeguard against impermissible foreign involvement in critical aspects of the enrichment process.⁴⁷

V. Recommendations for Needed Legislative Reform

A. *The FOCD Provision Cannot Be Effectively Reformed Without Congressional Action*

The FOCD Provision is a statutory relic unique to the Cold War era, and its continued existence in a global nuclear economy creates an unnecessary chilling effect on foreign investment into U.S. nuclear projects. No investor can reasonably risk investing billions into a nuclear project, only to find out years later that the NRC could pull the plug on licensing because of the investment itself—just as France’s EDF and Japan’s Toshiba found out the hard way. At the same time, the FOCD Provision provides no significant national security benefit, considering that at least three separate regimes police the same issue and also conduct substantive reviews of foreign involvement in the US nuclear industry.

To its credit, the NRC has recognized this disconnect. Although the NRC Commission found itself bound to uphold the denial of the UniStar license on FOCD grounds back in 2012, it nonetheless directed the NRC staff at that time to do a “Fresh Assessment” of the NRC’s foreign ownership

⁴⁵ The U.S. Department of Commerce’s (“DOC”) dual-use export control regime also regulates exports of technology and assistance concerning non-reactor systems, equipment, and tools in use at a nuclear power plant, as well as certain technology related to spent fuel storage. See 15 C.F.R. § 730 et seq. Even beyond DOE and DOC, the NRC separately regulates exports of physical reactor components. See 10 C.F.R. Part 110. Between these three regulators, the vast majority of valuable, proprietary technology at a nuclear power plant is controlled for export by at least one federal agency.

⁴⁶ *Recommendations for a Process to Conduct Inimicality Reviews for the Licensing of Utilization Facilities*, NRC Staff, SECY-16-0056 (Apr. 27, 2016), <https://www.nrc.gov/docs/ML1532/ML15320A283.pdf>.

⁴⁷ *Notice of Receipt of Application for License; Notice of Availability of Applicant’s Environmental Report; Notice of Consideration of Issuance of License; and Notice of Hearing and Commission Order*, 69 Fed. Reg. 5873 (Feb. 6, 2004); *NUREG-1827, Safety Evaluation Report for the National Enrichment Facility in Lea County, New Mexico*, at 1-5 (2005), <https://www.nrc.gov/docs/ML0517/ML051780290.pdf>. The National Enrichment Facility is indirectly owned by the European company URENCO.

requirements.⁴⁸ In 2014, the NRC staff came back with a lengthy review of all past examples of foreign ownership in nuclear power plants, and with recommendations to lessen certain FOCD-related burdens.⁴⁹ Eventually, the NRC staff issued a draft guidance document—while it did little more than memorialize the NRC staff’s FOCD precedent into guidance, although the staff did attempt to establish a possible path forward to foreign investments greater than 50%.⁵⁰

However, the draft was strongly criticized as still incorporating onerous requirements for mitigation of foreign control.⁵¹ Moreover, progress later stalled and the draft guidance was never finalized, for unclear reasons. It is important to also recognize that even if the guidance was finalized, it remains uncertain how it would be interpreted by courts given the broad language of the statute itself. The result is that more has to be done to update a decades-old law that ignores the global nature of the nuclear industry.

B. Recommendations

As a result of the significant problems posed by the FOCD Provision, and the inability for the provision to be appropriately reigned in at the agency level, NIA proposes two recommendations to amend the AEA:

- ***Recommendation 1: Congress should strike the FOCD Provision from the Atomic Energy Act.***

The best solution is also the most straightforward—the FOCD Provision should simply be struck from the AEA. As discussed above, the provision itself presents a significant burden, without providing any compensating national security benefit. Given that the FOCD Provision comprises one sentence in Section 103(d) of the AEA, the legislative amendment would be very straightforward, and could be worked into several nuclear bills currently working through Congress, such as the Nuclear Energy Leadership Act (S. 903).⁵²

- ***Recommendation 2: Congress should amend the AEA to permit the NRC to exempt certain low-risk countries from FOCD review, and require that the NRC implement this exemption within two years.***

In the alternative to a complete striking of the FOCD Provision, Congress can also revise the AEA to permit the NRC to exempt certain countries from FOCD review. This can be easily done by inserting a phrase such as “except as permitted by the Commission” to the end of the FOCD Provision in 42 U.S.C. §§ 2133(d) and 2134(d). This clause would permit the NRC, by rule or order of the NRC Commission, to exempt certain countries (and by extension the

⁴⁸ SRM-SECY-12-0168, Staff Requirements In Re: Calvert Cliffs 3 Nuclear Project, LLC & Unistar Nuclear Operating Services, LLC (Calvert Cliffs Nuclear Power Plant, Unit 3) (Mar. 11, 2013) (asking the NRC Staff to “provide a fresh assessment on issues relating to foreign ownership”), <https://www.nrc.gov/docs/ML1307/ML13070A150.pdf>.

⁴⁹ See generally SECY-14-0089.

⁵⁰ Draft Standard Review Plan on Foreign Ownership, Control, or Domination, Office of Nuclear Reactor Regulation, NRC-2016-0088 (2016), <https://www.regulations.gov/document?D=NRC-2016-0088-0002>.

⁵¹ See, e.g., Comments of the Nuclear Energy Institute on the NRC “Draft Standard Review Plan on Foreign Ownership, Control, or Domination, Revision 1,” and the NRC “Draft Regulatory Guide on Foreign Ownership, Control, or Domination of Nuclear Power, and Non-Power Production or Utilization Facility,” Docket No. NRC-2016-0088 (2016), <https://www.regulations.gov/document?D=NRC-2016-0088-0012>.

⁵² *Murkowski, Booker, and 13 Colleagues Reintroduce the Nuclear Energy Leadership Act*, U.S. Senate Committee on Energy & Natural Resources (Mar. 27, 2019), <https://www.energy.senate.gov/public/index.cfm/2019/3/murkowski-booker-and-13-colleagues-reintroduce>.

citizens and corporate entities of those countries) from the requirements of the FOCD Provision.

To ensure prompt implementation of this amendment, Congress should require that the NRC develop a list of countries to exempt from FOCD review, and present that list to Congress within 180 days after passage of the relevant legislation. Such a list could be based on given countries' historical commitments to non-proliferation and status as good actors in the nuclear community. This list could also take into account a country's adherence to U.S. and global nuclear safety and security standards, and other factors relevant to NRC and U.S. national security interests. Congress should require that the list of exempted countries then be codified by rulemaking within two years in total after passage of the relevant legislation.

Developing such a list is not difficult for the NRC or the U.S. government. It has already drafted such a list as part of its general license for the export of certain reactor equipment under 10 CFR Part 110.⁵³ Similarly, DOE as part of its Part 810 regulations has also established a similar list of destinations for which exports of nuclear reactor technology do not need prior U.S. government approval.⁵⁴ Lastly, recent revisions to CFIUS have established a concept of "excepted foreign states"—comprised of U.S. allies such as the United Kingdom and Canada—that can avoid some of the more stringent aspects of CFIUS reviews.⁵⁵

If the United States is unwilling to permit the inward flow of technology and investment from our allies and partners to make the U.S. a hub for innovation, then it will fall further behind in the pursuit of advanced reactor technology to competitors such as China and Russia. These countries are expending huge sums to promote their domestic and foreign programs and doing everything they can to source technology and dollars into their domestic champion companies. These efforts are seeing results, as they are securing project after project both in their own markets and abroad, often at the expense of U.S. companies. Only by working with its partners and allies can the United States reverse this trend and reestablish its leading role in the global nuclear and energy economy.

VI. Conclusion

The FOCD Provision was a product of world that doesn't exist today. Today, the U.S. industry is part of a global network and needs investment from abroad to grow and thrive. U.S. leadership in advanced reactors will only come from working with our allies and partners, many of whom are willing to invest heavily in this area. A Cold-War era restriction on foreign investment not only hampers U.S. innovation and foreign direct investment, as seen in the concrete examples discussed above, it is superfluous given the robust CFIUS and export control regimes and already in place. Reform of the FOCD Provision thus represents a simple way to grow foreign investment into U.S. advanced reactor deployment, in the process promoting domestic economic growth, jobs, and U.S. competitiveness in this critical technology.

⁵³ Under this regulation, the NRC permits exports of many nuclear reactor components without prior agency approval to a set of about three dozen countries it has pre-determined to be good actors—including Japan, France, and traditional U.S. allies. See 10 C.F.R. § 110.26(b).

⁵⁴ See 10 C.F.R. Part 810, Appendix A.

⁵⁵ Hogan Lovells, *Client Alert – U.S. Treasury Department Issues Final CFIUS Regulations* (Jan. 17, 2020), https://www.hoganlovells.com/~/_media/hogan-lovells/pdf/2020-pdfs/2020_01_17_us_treasury_department_issues_final_cfius_regulations.pdf.